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Bioefficacy of quinchlorac herbicide against weeds in transplanted rice

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Abstract
The Field experiment was conducted during Kharif season 2015 at Research Cum Instructional farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur C.G. to evaluate the quinchlorac herbicide against weeds in transplanted rice. Ten weed control treatments were laid out in randomized block design with three replications. The result revealed that the major weed species in experimental site were *Cyperus iria* L, *Cyanotis axillaris* L, *Alternanthera triandra* L, *Echinochloa colona* L, *Ischaemum rugosum Salisbury*, and *Caesulia axillaris* Roxb. Among the herbicides, minimum weed density (5.53) and dry matter of weeds/m^2 (5.18) were found under quinchlorac 250g/l SC + bispyribac sodium (10% SC) @ 250 + 20 g $ha^{-1.}$ Hand weeding twice at 60 and 80 DAT, gave highest weed control efficiency (86.02%) Whereas, quinchlorac 250g/l SC + bispyribac sodium (10% SC) @ 250 + 20 g ha^{-1} gave 74.93 and 80.40% weed control efficiency at 20 DAT and at harvest respectively. The highest grain yield (5.37 t ha^{-1}), straw yield (6.61 t ha^{-1}) and harvest index (44.81%) was recorded under quinchlorac 250g/l SC + bispyribac sodium (10% SC) @ 250 + 20 g ha^{-1}.

Keywords: Transplanted rice, herbicide, weed control efficiency, weed density

Introduction
Rice is the most important staple food crop of millions of mankind from down of civilization (Chakravarti *et al.* 2012) [5]. Among the cereal crops, it serves as the principal source of nourishment for over half of the global population (Davla *et al.* 2013) [6]. In world, rice is the second most widely consumed cereal next to wheat and it has occupied an area of 160.60 million hectares, with a total production of 738.20 million tonnes and productivity 3424.41kg ha^{-1} (Anonymous, a2015) [2]. 80 per cent of the world rice production mainly comes from Asian countries and Brazil. Among these countries, China is the largest producer of rice with a production of 197.3 million tonne and occupying an area of 29.9 million ha with a productivity of 6.59 tonne ha^{-1}. India is the second largest rice producer after China and has an area of over 44.1 million hectare with a production of 105.48 million tonnes with a productivity of 3020 kg ha^{-1} (Anonymous b, 2015) [3] contributing 26.0 per cent of world rice production. Chhattisgarh state is popularly known as "Rice bowl" because of maximum area covered during *kharif* under rice contributing major share in national rice production. Rice occupies an area of 3.64 million hectare with the production of 7.65 million tonnes and productivity of 1517 kg ha^{-1} (Anonymous c, 2015) [4].

The productivity of rice per unit area is poor, despite of suitable environmental conditions. One of major problem in rice cultivation for low productivity is weed infestation. Manna (1991) reported a yield reduction of 25 per cent in transplanted rice, 32 per cent in puddle broadcast rice and 52 per cent in direct- sown upland rice due to weeds. Yield reduction in transplanted rice due to unchecked weed growth is 47 per cent (Mukharjee and Singh, 2004) [12]. Weeds not only cause quantitative but they also hamper the quality of produce due to competition for nutrient, moisture, light and to some extent for space. Weed problem is generally of lower magnitude in transplanted system if puddling and proper water management is followed. In transplanted rice, weeds germinate few days after transplanting of seedling. Hand weeding is the most common and effective method of weed control in rice but it is being difficult and uneconomical day-by-day due to high wages and non-availability of labours at peak period of farm operation. Herbicide is the most effective and economic means of weed control, but inappropriate or wrong application may not only increase production cost and yield penalty but also may cause development of herbicide resistant weeds and environmental hazard (Karim *et al.* 2004) [9].

Herbicidal weed control methods offer an advantage to save man power and money, as a result, regarded as cost effective method of weed control (Ahmed *et al.* 2000) [1]. Therefore, timely weed control is imperative for realizing optimum level of productivity.

In Chhattisgarh state, application of new herbicides (molecules) is very limited. A new formulation named Quinchlorac has been identified as early post emergence herbicide for controlling annual grassy weeds especially *Echinochloa* sp. The relevant information on the use of new herbicide to control the post emergence weeds of transplanted rice is not available, especially under the agro-climatic conditions of Chhattisgarh plains.

Materials and Methods

The field was conducted at Research cum Instructional Farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur, during *kharif* season of 2015. The soil of experimental field was sandy loam in texture having low organic carbon (0.44) and available N, P, K content in the soil was 212.3, 18.5 and 324 kg ha^{-1} respectively, slightly alkaline reaction (pH 7.3) and EC (0.43 dSm^{-2}). Ten different weed control treatments viz T_1- Quinchlorac 250 g/l SC @ 125 g a.i. ha^{-1}, T_2- Quinchlorac 250 g/l SC @ 187.5 g a.i. ha^{-1}, T_3- Quinchlorac 250 g/l SC @ 250 g ha^{-1}, T_4- Quinchlorac 250 g/l SC + Ethoxysulfuron (15% WP) @ 250 + 15 g a.i. ha^{-1}, T_5- Quinchlorac 250g/l SC + Bispyribac sodium (10% SC) @ 250 + 20 g a.i. ha^{-1}, T_6- Quinchlorac 250 g/l SC @ 312.5 g a.i. ha^{-1} T_7 – Cyhalofop butyl 10% EC @ 100 g a.i. ha^{-1}, T_8- Penoxsulam 21.7% SC @ 20 g a.i. ha^{-1}, T_9- Hand Weeding twice, T_{10}-Control. The gross and net plot size were 5 x 5 and 4.2 x 4 m^2, respectively. Rice variety MTU-1010 was transplanted on July 18, 2015 with a spacing of 20 cm x 10 cm. The recommended dose of 100:60:40 kg N, P_2O_5 and K_2O ha^{-1} were applied through urea, diammonium phosphate and muriate of potash, respectively. Half nitrogen and full dose of P_2O_5 and K_2O was applied as basal before transplanting, and the remaining 50 kg N was applied in two equal splits at the maximum tillering and panicle initiation stage.

The herbicide were applied by knapsack sprayer fitted with flat-fan nozzle. The density and dry weight of weeds were taken at 60, 80 DAT and at harvest using a quadrate of 0.25 m^2 (0.5m x0.5m) was randomly placed at five places in each plot and then the species wise and total weed count was recorded. The data thus obtained, were transformed and express in number per square metre. The percent composition of weed flora was estimated from control. The weed biomass from different plots under all the treatments was recorded at 60, 80 DAT and at harvest. The weeds were first sun dried and there after kept in paper bag and dried in oven at 60ºC for 48 hours and dry weight were recorded till constant weight was achieved. Later on, the weed biomass was transformed g m^{-2}. The data obtained on various observations were tabulated and subjected to their analysis by using analysis of variance (ANOVA) and the treatment was tested by F test (Gomez and Gomez, 1984). Weed dry matter of weeds was subjected to square root of transformation *i.e.* $\sqrt{X + 0.5}$. Weed control efficiency was calculated at 60, 80 DAT and at harvest in relation to total weed dry matter using the following formula and expressed in percent.

$$WCE\ (\%) = \frac{\text{Dry weight of weeds in control plot - Dry weight of weeds in treated plot}}{\text{Dry weight of weeds in control plot}} \times 100$$

Results and Discussion

Weed flora

The major weed species observed in the experimental field were *Cyperus iria* L., *Cyanotis axillaris* L., *Alternanthera triandra* L., *Echinochloa colona* L., *Ischaemum rugosum* Salisbury, *Caesulia axillaris* Roxb. The percentage composition of *Cyanotis axillaris* L. was 25 and 24% recorded highest, respectively at 20 and 40 DAT. At 60, 80 DAT and at harvest the percentage composition of *Cyperus iria* L. was recorded highest.

Effect on weed dry matter and weed density

The data given in Table 1 indicate that at 60, 80 DAT and at harvest minimum weed density and lowest dry matter of weeds was recorded under the treatment quinchlorac 250g/l SC @ 250 g ha^{-1} + bispyribac sodium (10% SC) 20 g ha^{-1} (T_5), which was statistically at par to quinchlorac 250 g/l SC @ 250 g ha^{-1} + ethoxysulfuron (15% WP) @ 15 g ha^{-1} (T_4). The maximum weed density and highest dry matter of weeds was observed in control plot (T_{10}) throughout the crop growth period because no control measure was adopted in this plot. Similar results were observed by Hussain *et al*. (2008). Thapa and Jha (2002) who reported that the highest weed density and dry weight of weed was recorded in weedy plots. At 60 and 80 DAT highest weed control efficiency was recorded under two hand weeding (T_9) followed by quinchlorac 250g/l SC @ 250 g ha^{-1}+ bispyribac sodium (10% SC) 20 g ha^{-1} (T_5) and quinchlorac 250 g/l SC @ 250 g ha^{-1} + ethoxysulfuron (15% WP) @ 15 g ha^{-1} (T_4) . Minimum weed control efficiency was recorded under cyhalofop butyl 10% EC @ 100 g ha^{-1} (T_7) at all these stages. These results are in accordance with the finding of Khaliq *et al*. (2011) and Rao and Ratnam (2010).

Effect on Crop

The treatment quinchlorac 250g/l SC @ 250 g ha^{-1} + bispyribac sodium (10% SC) @ 20 g ha^{-1} (T_5) registered highest number of effective tillers which was significantly superior over quinchlorac 250 g/l SC @ 125 g ha^{-1} (T_1), quinchlorac 250 g/l SC @ 187.5 g ha^{-1} (T_2), cyhalofop butyl 10% EC @ 100 g ha^{-1} (T_7) and Control (T_{10}). Expect, hand weeding twice at 20 and 40 DAT (T_9), quinchlorac 250 g/l SC @ 250 g ha^{-1} + ethoxysulfuron (15% WP) @ 15 g ha^{-1} (T_4), penoxsulam 21.7% SC @ 20 g ha^{-1} (T_8) and quinchlorac 250 g/l SC @ 312.5 g ha^{-1} (T_6) , recorded at par effective tillers $hill^{-1}$. The lowest number of effective tillers $hill^{-1}$ was noted under control (T_{10}). Quinchlorac 250g/l SC @ 250 g ha^{-1}+ bispyribac sodium (10% SC) @ 20 g ha^{-1} (T_5) recorded maximum number of filled and minimum number of unfilled grains $panicle^{-1}$.

As regards to filled grains $panicle^{-1}$ the best performing treatment quinchlorac 250g/l SC @ 250 g ha^{-1} + bispyribac sodium (10% SC) @ 20 g ha^{-1} (T_5) was at par to hand weeding twice at 20 and 40 DAT (T_9), quinchlorac 250 g/l SC @ 250 g ha^{-1} + ethoxysulfuron (15% WP) @ 15 g ha^{-1} (T_4), penoxsulam 21.7% SC @ 20 g ha^{-1} (T_8) and quinchlorac 250 g/l SC @ 312.5 g ha^{-1} (T_6) whereas, for unfilled grains $panicle^{-1}$ it was at par to hand weeding twice at 20 and 40 DAT (T_9), quinchlorac 250 g/l SC @ 250 g ha^{-1} + ethoxysulfuron (15% WP) @ 15 g ha^{-1} (T_4), penoxsulam 21.7% SC @ 20 g ha^{-1} (T_8), quinchlorac 250 g/l SC @ 312.5 g ha^{-1} (T_6) and quinchlorac 250 g/l SC @ 250 g ha^{-1} (T_3). The lowest number of filled grains $panicle^{-1}$ was noted in control (T_{10}), whereas this treatment also recorded the highest number of unfilled grains $panicle^{-1}$. The perusal of data given in Table-2 reveal that Quinchlorac 250g/l SC + bispyribac sodium(10% SC) @ 250 + 20 g a.i. ha^{-1} registered significantly highest grain yield (5.37 t ha^{-1}), however, it was found at par with the application of quinchlorac 250 g/l SC +

ethoxysulfuron (15% WP) @ 250 + 15 g a.i.ha^{-1} (5.08 t ha^{-1}), quinchlorac 250 g/l SC @ 312.5 g a.i ha^{-1} (4.79 t ha^{-1}), penoxsulam 21.7% SC @ 20 g a.i ha^{-1} (4.89 t ha^{-1}), quinchlorac 250 g/l SC @ 250 g a.i ha^{-1} (4.70 t ha^{-1}) and hand weeding twice 20 and 40 DAT (5.18 t ha^{-1}). The minimum seed yield was observed under control (1.57 t ha^{-1}). Similar results was also reported by Nerwal *et al*. (2002) and Yadav *et al*. (2009). The straw yield was significantly influenced by different treatments. Quinchlorac 250g/l SC + bispyribac sodium(10% SC) @ 250 + 20 g a.i. ha^{-1} (6.61 t ha^{-1}) produced the highest straw yield and it was significantly superior to others but it was at par to application of quinchlorac 250 g/l SC @ 250 g a.i ha^{-1} (6.19 t ha^{-1}), quinchlorac 250 g/l SC + ethoxysulfuron (15% WP) @ 250 + 15 g a.i.ha^{-1} (6.40 t ha^{-1}), quinchlorac 250 g/l SC @ 312.5 g a.i ha^{-1} (6.26 t ha^{-1}), penoxsulam 21.7% SC @ 20 g a.i ha^{-1} (6.28 t ha^{-1}), and hand weeding twice 20 and 40 DAT (6.42 t ha^{-1}). The minimum straw yield (2.78 t ha^{-1}) was noted under control. Similar findings were also reported by Jason *et al*., 2007, Yadav *et al*., 2009. Different early post emergence herbicides influenced harvest index (%) significantly. Quinchlorac 250g/l SC + bispyribac sodium (10% SC) @ 250 + 20 g a.i. ha^{-1} recorded significantly highest (44.81%) harvest index and lowest (36.10%) was obtained under control (T_{10}).

Table 1: Total weed density, weed dry matter of weeds and weed control efficiency as affected by weed management practices at various time interval.

Treatments		Dose (g ha^{-1})	Time of application DAT	Density of total weeds (No m^{-2})		Dry matter of total weeds (gm^{-2})				Weed control efficiency (%)	
				60 DAT	80 DAT	At harvest	60 DAT	80 DAT	At harvest	60 DAT	80 DAT
T_1	Quinchlorac 250 g/l SC	125	15	7.48 (55.56)	8.22 (66.89)	8.38 (70.14)	7.59 (57.07)	8.57 (72.93)	8.32 (68.74)	34.91	43.64
T_2	Quinchlorac 250 g/l SC	187.5	15	7.00 (48.52)	7.94 (62.48)	8.06 (64.48)	7.15 (50.83)	7.93 (62.49)	7.91 (62.21)	42.02	51.71
T_3	Quinchlorac 250 g/l SC	250	15	6.51 (42.45)	7.42 (54.59)	7.52 (55.87)	6.55 (42.35)	7.40 (54.45)	7.39 (54.47)	51.69	57.92
T_4	Quinchlorac 250 g/l SC + Ethoxysulfuron (15% WP)	250+15	15	5.26 (28.07)	5.85 (33.92)	5.95 (34.51)	4.78 (22.34)	5.70 (31.97)	6.16 (37.52)	74.52	75.29
T_5	Quinchlorac 250g/l SC + Bispyribac sodium(10% SC)	250+20	15	5.05 (25.03)	5.47 (29.60)	5.53 (30.64)	4.48 (19.72)	5.17 (26.44)	5.18 (26.52)	77.50	79.57
T_6	Quinchlorac 250 g/l SC	312.5	15	6.33 (39.99)	7.05 (49.18)	7.27 (52.49)	6.00 (35.69)	6.96 (48.36)	7.03 (49.04)	59.30	62.63
T_7	Cyhalofop butyl 10% EC	100	15	7.58 (57.14)	8.26 (67.66)	8.41 (70.26)	7.93 (62.45)	9.33 (86.65)	9.79 (95.54)	28.77	33.04
T_8	Penoxsulam 21.7% SC	20	15	5.76 (32.73)	6.53 (42.69)	6.69 (44.86)	5.30 (27.88)	6.11 (36.89)	6.73 (44.76)	68.20	71.49
T_9	Hand weeding twice	-	20 & 40	5.11 (25.77)	5.65 (31.43)	5.71 (32.13)	3.57 (12.26)	4.67 (21.33)	5.55 (33.38)	86.02	83.52
T_{10}	Control	-		8.90 (78.98)	9.89 (97.61)	9.93 (99.95)	9.37 (87.67)	11.40 129.40)	11.64 (135.30)	-	-
SEm±				0.38	0.35	0.41	0.27	0.4	0.37		
CD (P=0.05)				1.12	1.05	1.23	0.79	1.18	1.09		

Table 2: Yield attributing characters of transplanted rice as affected by weed management practices.

Treatment		Dose (g ha^{-1})	Time of application DAT	Effective tillers hill^{-1} (No.)	Total number of grain panicle^{-1}	Filled grains panicle^{-1} (No.)	Unfilled grains panicle^{-1} (No.)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Harvest index (%)
T_1	Quinchlorac 250 g/l SC	125	15	95.57	10.33	26.82	3.93	5.47	41.84	5.47
T_2	Quinchlorac 250 g/l SC	187.5	15	99.31	10.00	26.83	4.12	5.57	42.47	5.57
T_3	Quinchlorac 250 g/l SC	250	15	100.80	9.33	26.87	4.63	6.19	42.80	6.19
T_4	Quinchlorac 250 g/l SC + Ethoxysulfuron (15% WP)	250+15	15	122.08	8.00	27.02	5.08	6.40	44.25	6.40
T_5	Quinchlorac 250g/l SC + Bispyribac sodium(10% SC)	250+20	15	127.31	7.33	27.08	5.37	6.61	44.81	6.61
T_6	Quinchlorac 250 g/l SC	312.5	15	111.25	9.00	26.94	4.79	6.26	43.36	6.26
T_7	Cyhalofop butyl 10% EC	100	15	86.99	11.00	26.77	2.97	4.72	38.61	4.72
T_8	Penoxsulam 21.7% SC	20	15	115.73	8.33	26.98	4.89	6.28	43.76	6.28
T_9	Hand weeding twice	-	20 & 40	124.69	7.67	27.03	5.18	6.42	44.64	6.42
T_{10}	Control	-		77.67	15.67	25.95	1.57	2.78	36.10	2.78
Sem±				0.40	6.28	6.20	0.77	0.25	0.33	1.71
CD(P=0.05)				1.19	18.67	18.43	2.28	0.75	0.98	5.08

References

1. Ahmed GJU. Mamun AA. Hossain SMA, Mridha AJ, Hossain ST. Agro-economic study of weed control in direct seeded Aus rice in the farmer's field. Annals of Bangladesh Agriculture. 2000; 8(2):111-118.
2. Anonymous A. FAO. Rice Market Monitor and market division Food and Agriculture Organisation of United Nations, 2015.
3. Anonymous B. Agricultural Statistics Division, Department of Economics and Statistics, Department of agriculture and Cooperation. New Delhi, India, 2015.

4. Anonymous C. State Level Agricultural Statistics, Directorate of Agriculture Raipur, Chhattisgarh, 2015.
5. Chakrawarti SK, Kumar H, Lal JP, Vishwakarma MK. Induced mutation in traditional aromatic rice-frequency and spectrum of viable mutations and characterizations of economic values. The Bioscan. 2012; 7(4):739-742.
6. Davla Sasidharan, Macwana Chakraborty, Trivedi R, Ravikiran R, Shah G. Molecular characterization of rice (*Oryza sativa* L.) genotypes for salt tolerance using microsatellite markers. The Bioscan. 2013; 8(2):498-502.
7. Gomez KA, Gomez AA. Statistical procedures for Agricultural Research. A Willey Inter science Publication, John Willey and Sons, New York. 1984, 108-127.
8. Hussain S, Ramzan M, Akhter M, Aslam M. Weed management in direct seeded rice. Journal of Animal and Plant Sciences. 2008; 18(2/3):86-88.
9. Karim SMR, Azmi BM, Ismail BS. Weed problems and their management in rice fields of Malaysia: An overview. Weed Biology Management. 2004; 4:177-186.
10. Khaliq Abdul, Matloob Amar, Shafiq HM, Cheema ZA, Wahid Abdul. Evaluating sequential application of pre and post emergence herbicides in dry seeded fine rice. Pakistan Journal Weed Science Research. 2011; 17(2):111-123.
11. Jason A Bond, Timothy W Walker, Eric P Webster, Nathan W Buehring, Dustin L Harrell. Rice cultivar response to Penoxsulam. Weed Technology. 2007; 21(4):961–965.
12. Mukharjee D, Singh RP. Efficiency of low dose herbicides on divergent weed flora in transplanted rice. Oryza. 2004; 41:20-23.
13. Narwal S, Singh S, Panwar KS, Malik RK. Performance of acetachlor and anilofos + ethoxysulfuron for weed control in transplanted rice (*Oryza sativa* L.). Indian Journal of Agronomy. 2002; 47(1):67-71.
14. Rao AS, Ratnam M. Evaluation of post emergence herbicides on weed control in rice nursery. Pakistan Journal of Weed Science Research. 2010; 16(4):387-392.
15. Thapa CB, Jha PK. Paddy crop-weed competition in Pokhara, Nepal. Geobios. 2002; 29(1):51-54.
16. Yadav DB, Yadav A, Punia SS. Evaluation of bispyribac-sodium for weed control in transplanted rice. Indian Journal of Weed Science. 2009; 41(1 & 2):23-27.